

Appl. No. 10/656,343

Amdt. Dated 11/18/2005

Reply to Office action of August 18, 2005

Amendments to the Drawings:

There are no amendments to the drawings.

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REMARKS/ARGUMENTS

DETAILED ACTION

Claims 1-17 are pending.

Claims 1-17 are rejected.

Claim Objections

Claim 11 is objected to because of the following informalities:

Claim 11 states "power amplification" at the end of line 2, and is believed to more properly read "pre-amplification", and has been examined as such. Appropriate correction is required.

Claim 11 is hereby amended to provide the appropriate correction as noted by Examiner.

Claim Rejections - 35 USC § 103

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unternahrer (US 6108357) in view of Pang (US 2003/0193975).

The gain media and pumping mechanisms of Unternahrer and Pang are significantly different from each other, especially in the nature of the pumped region that they create. Pang's system, like Applicant's, produces a relatively narrow small-diameter pumped region; whereas Unternahrer's system produces a relatively large-area pumped region. Thus Unternahrer's amplification passes can avoid damage to the gain medium by the technique of spatial separation, i.e., passing through different areas of the pumped region (see his Fig. 2 with three separate paths for the three power amplification beam passes 14, all separate from the pre-amp pass path 12). Unternahrer's spatial separation technique cannot be applied to Pang's and Applicant's systems because the pumped region is too small. A second technique used by Unternahrer's system is polarization separation. This technique also cannot be applied to Pang's and Applicant's systems because their gain media are sensitive to beam polarization while Unternahrer's is not.

A final way that Pang and Unternahrer's systems could theoretically be combined would

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be to simply apply Unternahrer's upcollimation telescope (60) and spatial filtering aperture (62) to Pang's system. Although this is theoretically possible, it is impractical because of the limitations of the Pockels cell (34) as noted by Unternahrer in column 1, lines 49-67, especially lines 61-63. It should also be noted that amplifying passes that go through the Pockels cell in both systems are necessarily collinear in order to pass through both the gain medium and a reasonably sized Pockels cell. Although Unternahrer also uses a Pockels cell, he bypasses it for the power amplification passes by employing a mirror system other than the cavity mirrors (26, 28) for the power amplification passes. It is not at all obvious how Unternahrer's power amplification mirror system could be applied to Pang's system with the additional requirement (imposed by the type of gain medium) of not changing either the polarization or the spatial separation of the beam passes in the gain medium.

Accordingly, the independent claims 1 and 8 (and 15) are amended to cite those characteristics of Applicant's method and system that uniquely distinguish them from those of the prior art. In particular, the use of cavity mirrors in combination with other means such as retro mirrors (supported by claim 16, page 11 and Fig. 3A) is cited for directing at least the power amplification beams through the gain medium, in distinction from Unternahrer and Pang who do not use the cavity mirrors that way. Consequently, claim 16 is canceled for being redundant of the amended claim 15. Also distinct from Unternahrer, language is added to specify that the power amplification passes and the pre-amplification passes are all "non-collinear" (page 11) and directed through a "central portion of the pumped region of the pumped gain medium". The latter citation is supported by Figures 5A-5B, their description on page 14, and with reference to Figures 1-2. Antecedent descriptions of the "cavity mirrors" and the "pumped region" are added to the second clause of these claims.

Additional changes to the claims concern clarifying the references to beam diameter. As noted in the detailed description (e.g., page 12, third paragraph and Fig. 4 versus Figs. 5A-5B) the beam diameter outside the gain medium is different than the beam diameter when passing through the pumped region 305a of the gain medium 305. Therefore, throughout the claims, all references to beam diameter are limited to mean the beam diameter in the pumped gain medium (as originally stated in claim 8, for example). This amendment is applied in claims 1, 6, 8, 13,

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and 15. Also, for the same reason, claims 3, 10, and 17 are amended to replace the word "increasing" with the word "changing" (as originally stated in claim 1).

In another clarification action, claim 1 referred to the seed beam having a "small beam diameter" but did not specify where it was small, and did not specify that the re-collimated beam was made larger (in the gain medium). Therefore the small beam diameter citation was moved from the first clause to the third clause where it could be combined with the limitation of meaning the diameter in the pumped gain medium, and the following phrase is added to the fourth clause to limit the re-collimated intermediate beam such that it is "having a beam diameter in the pumped gain medium that is large". This change is supported, for example, by the original claims 8 and 15.

In another clarification action, claims 1 and 8 have been amended to replace the term "redirecting" with "directing", in order to be consistent with the language of the dependent claims such as claim 2.

With respect to the dependent claims, in addition to what is already stated above, claims 2 and 9 are amended as explained above to recite the central portion of the pumped region, and the non-collinear limitations of claim 1.

Claim 13 is further amended to replace "a" with "the" before "pumped region" since the term has an antecedent in claim 8.

Claim 16 is canceled for redundancy as explained above.

Claim 17 is further amended to more clearly specify "the lens system" by inserting the adjective "re-collimating" as used in claim 15.

Applicant wishes to comment further on certain of Examiner's rejection statements for the dependent claims.

In particular, with respect to claim 6, Examiner states that "Unternahrer and Pang teach the method as outlined in the rejection to claim 1, and Unternahrer further teaches controlling the re-collimated beam diameter to match a pumped region of the gain medium (col.6 lines 38-40, 49-51, 60-62, speaking of increasing the beam diameter to more closely match pumped gain region size)." Applicant respectfully submits that neither patent mentions "closely matching" the beam diameter to the gain region size, rather Unternahrer simply teaches *increasing* the beam

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size, and furthermore teaches against matching size since that would not result in the spatially separated beam paths that he teaches.

With respect to claim 7, Examiner states that "Unternahrer and Pang teach the method as outlined in the rejection to claim 1 above, and Pang further teaches the gain medium to be Ti:Sapphire ([0003]). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of Unternahrer with the gain medium of Pang as Ti:A1203 is a well known gain medium in regenerative amplifiers (Pang, [0003]) and provides a broad gain spectrum suitable for use with many seed lasers." Applicant respectfully disagrees for the reasons stated above concerning the incompatibility of the two systems.

With respect to claim 13, Applicant reiterates the comments stated above with respect to claim 6.

Claims 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unternahrer in view of Pang, and further in view of Karasawa et al. (US 6700905).

The amendments to claims 15-17 described hereinabove are believed to address this rejection.

New Claims

Claim 18, depending from claim 17, has been added to further limit the nature of the spatial filter to being "an aperture disposed at a focal point in the re-collimating lens system". This claim is supported by Fig. 3A and its explanation in the detailed description on page 11. It can be seen that this claim further distinguishes Applicant's claims from the disclosures of the prior art, such as Unternahrer's aperture (62) that is placed between the cavity mirrors (26 and 28).

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Conclusion

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,



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CERTIFICATE OF TRANSMISSION BY FACSIMILE

I hereby certify that this correspondence is being transmitted to the United States Patent and Trademark Office (Fax No. 571-273-8300) on November 18, 2005.

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Date of Person signing

: November 18, 2005